

REMARKS

Applicants appreciate the thoroughness with which the Examiner has examined the above-identified application. Reconsideration is requested in view of the remarks below.

Claims 1, 3-11 and 14-19

Claims 1, 3-11 and 14-19 stand rejected under 35 USC § 103 as being obvious from Blette et al. U.S. Patent No. 5,186,982, and separately from Bryning et al. U.S. Patent Publication No. 2001/0009136. Applicants respectfully traverse these rejections.

As recited in claim 1, the instant method initially provides a dispensing apparatus comprising an orifice member having first and second surfaces and a bore therethrough between the surfaces, a pressurized chamber adjacent the orifice member first surface for flowable material, and a punch having a face movable through the orifice member bore. The method then includes positioning the punch outside the orifice member bore such that the punch face is spaced from the orifice member first surface and flowing a desired amount of flowable material onto the punch face from the chamber. After depositing the desired amount of flowable material onto the workpiece, the punch is retracted until the punch face is substantially coplanar with the orifice member second surface.

Blette et al. U.S. Patent No. 5,186,982

Blette discloses a method for dispensing liquid materials such as small dots of solder paste. Unlike the present claimed method, Blette does not disclose an orifice member having first and second surfaces and a bore therethrough between the surfaces, or a pressurized chamber adjacent the orifice member first surface containing flowable material for flowing a desired amount of the flowable material onto the punch face.

Instead, Blette has a conduit 38, intersecting passageway 16 at an intermediate point, through which the liquid material is directed onto the pin 22. Blette, column 3, lines 33-42 and Figs. 1 and 2. Blette has no "first surface" from which pin 22 is spaced for flowing flowable material onto the face of the pin.

Furthermore, after depositing the flowable material, applicant's method retracts the punch until the punch face is substantially coplanar with the orifice member second surface. Blette shows no such retracted position wherein the face of pin 22 is coplanar with a "second surface" as in applicants' method.

The Examiner has acknowledged that Blette fails to teach retracting a pin or punch "until the punch face is substantially coplanar with the orifice member second surface" as recited in claim 1. However, the Examiner dismisses this step as "a matter of design choice by one practicing in the art." Office Action, p.8. However, the present invention in part is directed to solving the problem of clogged nozzles in a method for dispensing conductive paste. See, specification, page 2, lines 6-8. As stated in the specification, this problem is solved by the claimed method of retracting the punch face to be coplanar with the orifice member second surface:

When sitting idle the punch is positioned such that the tip of the punch is flush with the bottom of the orifice. This allows the orifice and punch tip to be wiped clean of any residual paste and also seals the paste chamber to prevent premature drying of the paste.

Specification, page 9, lines 25-28. There is simply no disclosure or suggestion in Blette of retracting the punch face in this manner to provide the significant and unexpected advantages achieved by applicants' claimed method.

Blette also does not disclose the other features and limitations of applicants' dependent claims, such as sealing the bore and chamber when the punch face is retracted to be coplanar with the second surface (claim 5), the diameter of the orifice bore less than 72 μm (claim 6), the diameter of deposited flowable material less than 50 μm (claim 7), the deposit of less than 50 picolitres of the flowable material on the workpiece (claim 8), the deposit of conductive, adhesive paste on a ceramic greensheet (claim 9), the repeated depositing of flowable material onto a previously deposited amount of flowable material to create a desired height of flowable material on the workpiece (claim 11), repeating the depositing of the flowable material and simultaneously adjusting the spacing of the punch face from the orifice member first surface to adjust the desired amount of flowable material on the punch face (claim 14), adjusting the distance the punch face extends beyond the orifice member second surface to adjust the diameter of the desired amount of flowable material deposited onto the workpiece (claim 15), simultaneously measuring size of the flowable material deposited onto the workpiece and using the size measurement to adjust the distance the punch face extends beyond the orifice member second surface and the size of the desired amount of flowable material deposited onto the workpiece (claim 16), repeatedly moving the punch from a position outside the orifice member bore, where the punch face is spaced from the orifice member first surface, through the orifice member bore to a position where the punch face is substantially coplanar with the orifice member second surface, prior to extending the punch face beyond the orifice member second surface and depositing the desired amount of flowable material onto the workpiece (claim 18), and measuring the distance of the workpiece to

the orifice member second surface and, using the distance measurement, adjusting the distance the punch face extends beyond the orifice member second surface and the diameter of the desired amount of flowable material deposited onto the workpiece (claim 19).

In connection with claims 14-16 and 19, although the Examiner takes the position that a controlling mechanism is taught in Blette, the particular limitations of these claims are not disclosed or suggested in Blette. Accordingly, applicants' claimed method recited in claims 1, 3-11 and 14-19 is not obvious from Blette et al. U.S. Patent No. 5,186,982.

Bryning et al. U.S. Patent Publication No. 2001/0009136

Bryning discloses a method for dispensing a small volume of liquid, such as biological sample or reagent. As with Blette, Bryning discloses no orifice member having first and second surfaces and a bore therethrough between the surfaces, or a pressurized chamber adjacent the orifice member first surface containing flowable material for flowing a desired amount of the flowable material onto the punch face. Instead, Bryning has a tube 14, having a larger upper diameter than its lower diameter, through which the liquid material is forced by fiber 12. Bryning has no "first surface" from which fiber 12 is spaced for flowing flowable material onto the face of the pin.

Likewise, Bryning shows no such retracted position wherein the face of fiber 12 is coplanar with a "second surface" as in applicants' method. While the Examiner also takes the position that this coplanar retraction is a mere "design choice," (Office Action, p.8), the applicants have presented the instant invention as directed in part to solving the problem of clogged nozzles, and have expressly stated the advantage that "[i]n this position any

residual paste may be cleaned from the punch face and orifice surface 58b by wiping or spraying with a cleaner." Specification, page 12, lines 21-22. Bryning suggests no such retraction step advantage nor any advantage of doing so.

Bryning also discloses none of the limitations of applicants' dependent claims 5, 9, 11, 14-16, 18 and 19 as described above in connection with Blette.

In connection with claims 14-16 and 19, although the Examiner takes the position that a controlling mechanism is taught in Bryning, the particular limitations of these claims are not disclosed or suggested in Bryning. Accordingly, applicants' claimed method recited in claims 1, 3-11 and 14-19 is not obvious from Bryning et al. U.S. Patent Publication No. 2001/0009136.

Claims 1, 3, 4, 6-11 and 14-19

Claims 1, 3, 4, 6-11 and 14-19 stand rejected under 35 USC § 103 as being obvious from Brooks U.S. Patent No. 6,915,928. Applicants respectfully traverse this rejection.

Brooks is directed to an electromagnetic method for dispensing liquids such as adhesives. Brooks, like the previous references discussed above, discloses no orifice member having first and second surfaces and a bore therethrough between the surfaces, or a pressurized chamber adjacent the orifice member first surface containing flowable material for flowing a desired amount of the flowable material onto the punch face. Unlike applicants' method, Brooks employs a conical dispensing tip 6 having an internal chamber for the adhesive with upwardly expanding diameter through which a pin 5 (Figs. 1 and 2) or 17 (Figs. 3-5) moves between a retracted position within the lower portion of

the tip and an extended position outside the tip. Bryning has no "first surface" from which pin 5 or 17 is spaced for flowing flowable material onto the face of the pin. Likewise, Brooks shows no such retracted position wherein the face of pin 5 or 17 is coplanar with a "second surface" as in applicants' method. Again, the Examiner states that this step of retracting the punch face to be substantially coplanar with the orifice member second surface is but a "design choice" (Office Action, p.8), yet can point to no suggestion in Brooks of a method that "reduces the problems of clogged nozzles in dispensing conductive paste onto a greensheet" as the present invention does. Specification, page 20, lines 8-9.

Brooks also discloses none of the limitations of applicants' dependent claims 5, 9, 11, 14-16, 18 and 19 as described above in connection with Blette.

In connection with claims 14-16 and 19, although the Examiner takes the position that a controlling mechanism is taught in Brooks, the particular limitations of these claims are not disclosed or suggested in Brooks. Accordingly, applicants' claimed method recited in claims 1, 3-11 and 14-19 is not obvious from Brooks U.S. Patent No. 6,915,928.

Claim 2

Claim 2 stands rejected under 35 USC § 103 as being obvious from Blette et al., Brooks or Bryning et al. in combination with Bibeault et al. U.S. Patent No. 6,775,879. Applicants respectfully traverse this rejection.

Claim 2 adds to the method of claim 1 the step of cleaning the punch face and coplanar orifice member second surface to remove any residual flowable material thereon,

after the punch face is retracted to be substantially coplanar with the orifice member second surface.

The Examiner has admitted that Blette, Brooks and Bryning "fail to teach cleaning the pin to remove residual coating material." Office Action, p.5. However, Bibeault does not disclose the cleaning method or punch position as recited in claim 2. Bibeault positions the dispensing needle 26 over a cleaning orifice 70, and then activates an airflow to flow past the end of needle 26 to remove liquid residue. Bibeault does not disclose cleaning a punch face while the punch face is retracted to be substantially coplanar with the orifice member second surface.

While the failure of Bibeault to disclose cleaning a punch face while it is retracted in the coplanar position is in fact admitted by the Examiner (Office Action, p.8), the Examiner takes the position:

[O]ne skilled in the art would be suggested to clean the pin/punch after deposition and prior to retracting within the orifice so as to prevent clogging. Hence, the cleaning would be done either outside of the coplanar state or at the coplanar state. It is the examiner's position that this combination would suggest to one skilled in the art to either position with that expectation of achieving similar success."

Office Action, pp.8-9. However, Bibealt fails to teach retracting to a coplanar position at all. Consequently, any suggestion to do so, and then to clean the punch face only after it is in this coplanar position comes from a reading of applicants' own specification. This amounts to impermissible hindsight, and not from any suggestion in Bibeault or to one of ordinary skill in the art. As such, applicants' claim 2 is not obvious from the combination of the primary references with Bibeault et al. U.S. Patent No. 6,775,879.

Claims 12 and 13

Claims 12 and 13 stand rejected under 35 USC § 103 as being obvious from Blette et al., Brooks or Bryning et al. in combination with Banno et al. U.S. Patent No. 6,761,925 or Speakman U.S. Patent No. 6,503,831. Applicants respectfully traverse this rejection.

Both claims 12 and 13 specify that the flowable material is a conductive paste and the workpiece is a ceramic greensheet. However, neither Banno nor Speakman teach applying a conductive paste to a ceramic greensheet, and therefore cannot render obvious the method of applicants' claims 12 and 13.

Claims 20, 22 and 23

Claims 20, 22 and 23 stand rejected under 35 USC § 103 as being obvious from Blette et al., Brooks or Bryning et al. in combination with Hess et al. U.S. Patent Publication No. 2003/0119193. Applicants respectfully traverse this rejection.

Claim 20 is directed to a method of dispensing a conductive paste onto a ceramic greensheet comprising initially providing dispensing apparatus of the same type as recited in claim 1. In a manner analogous to that of claim 1, the method requires positioning the punch outside the orifice member bore such that the punch face is spaced from the orifice member first surface and flowing a desired amount of conductive paste onto the punch face from the chamber. The method of claim 20 further includes depositing additional desired amounts of conductive paste onto the greensheet in the form of dots, calibrating size of the dots of conductive paste applied onto the greensheet by measuring the size of the dots, adjusting parameters for dispensing the conductive paste onto the greensheet

based on measurements of the size of the dots, and retracting the punch until the punch face is substantially coplanar with the orifice member second surface.

As discussed above in connection with claim 1, neither Blette, Brooks nor Bryning disclose any orifice member having first and second surfaces and a bore therethrough between the surfaces, a pressurized chamber adjacent the orifice member first surface containing conductive paste for flowing a desired amount of the paste onto the punch face when it is positioned outside the orifice member bore such that the punch face is spaced from the orifice member first surface, or a retracted position wherein the punch face is substantially coplanar with the second surface of the orifice member. Hess likewise lacks the disclosure of such limitations of claim 20. These deficiencies alone prevent the combination of Blette, Brooks, Bryning and Hess from establishing *prima facie* obviousness of claim 20.

The Examiner acknowledges that Blette, Brooks and Bryning "fail to teach a calibrating step of measuring the size of the droplets" (Office Action, p.6.), but cites Hess for such disclosure. Applicants respectfully disagree that the hypothetical combination renders the invention of claim 20 obvious.

Hess states in paragraph 0112 "a controller having feedback control may be used to recalibrate the dispenser. The size of the droplet dispensed, or another characteristic of the droplet, is measured and parameters of the dispenser can be adjusted accordingly." However, as described in applicants' specification and drawings, the applicant may use the distance that the punch face is spaced from the orifice member first surface in order to provide different amounts of conductive paste on the punch face for deposition. See

Specification, page 12, lines 23-25 and page 13, lines 8-19 and Fig. 4. Since the Blette, Brooks, Bryning and Hess references lack such disclosure or suggestion, claim 20 is not obvious from these references.

Claim 22, dependent on claim 20, recites that calibration of size of the dots of conductive paste includes determining rate of change of the size of the dots on the greensheet, determining average size of the dots on the greensheet, and determining difference in size between dots on the greensheet, that the adjustment of parameters for dispensing the conductive paste onto the greensheet is based on one or more of the determinations of rate of change of the size of the dots, average size of the dots and difference in size between smallest and largest dots on the greensheet. Claim 23, dependent on claim 22, further recites assigning a calibration score based on the determinations of rate of change of the size of the dots, average size of the dots and difference in size between smallest and largest dots on the workpiece surface.

The Hess disclosure of feedback control is based on "the size of the droplet dispensed, or another characteristic of the droplet." Hess, p.9, para. 0112. Hess does not disclose or suggest any calibration based on dynamic comparison of measurements of a plurality of droplets, such as the determinations of rate of change of the size of the dots, average size of the dots and difference in size between smallest and largest dots on the workpiece surface recited in claims 22 and 23. The Examiner states only that he "disagrees" and that Hess "teaches a feedback control loop with calibration of the droplets." Office Action, p.9. However, the Examiner fails to cite in Hess any disclosure or suggestion of the specific determinations of rate of change of the size of the dots,

average size of the dots or difference in size between smallest and largest dots on the greensheet, to calibrate the size of the dots. Therefore, Hess cannot render claims 22 or 23 obvious to one of ordinary skill in the art.

Claim 21

Claim 21 stands rejected under 35 USC § 103 as being obvious from Blette et al., Brooks or Bryning et al. in combination with Hess et al. and further in combination with Bibeault et al. Applicants respectfully traverse this rejection.

Claim 21, is dependent on claim 20, and recites the same subject matter as contained in claim 2, i.e., after the punch face is substantially coplanar with the orifice member second surface, further including cleaning the punch face and coplanar orifice member second surface to remove any residual flowable material thereon.

The Examiner again admits that Blette, Brooks, Bryning and Hess "fail to teach cleaning the pin to remove residual coating material." Office Action, p.7. For the same reasons given above in connection with claim 2, applicants submit that Bibeault does not disclose the cleaning method or punch position as recited in claim 20.

It is respectfully submitted that the application has now been brought into a condition where allowance of the entire case is proper. Reconsideration and issuance of a notice of allowance are respectfully solicited.

Respectfully submitted,



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